



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number : **0 614 844 A3**

EUROPEAN PATENT APPLICATION

(21) Application number : **94301697.2**

(51) Int. Cl.⁵ : **B66B 13/14**

(22) Date of filing : **10.03.94**

(30) Priority : **10.03.93 US 29203**

(43) Date of publication of application :
14.09.94 Bulletin 94/37

(84) Designated Contracting States :
CH DE ES FR GB IT LI

(88) Date of deferred publication of search report :
25.01.95 Bulletin 95/04

(71) Applicant : **OTIS ELEVATOR COMPANY**
10 Farm Springs
Farmington, CT 06032 (US)

(72) Inventor : **Barrett, David W.**
29 Pell Road
East Hartland, Connecticut 06027 (US)
Inventor : **Peruggi, Richard E.**
153 Hurlburt Street
Glastonbury, Connecticut 06033 (US)
Inventor : **Bialy, Louis**
15 Hearthstone Drive
Simsbury, Connecticut 06070 (US)
Inventor : **Gagnon, Ernest P.**
151 Ralph Road
Manchester, Connecticut 06040 (US)

(74) Representative : **Hague, Alison Jane**
Frank B. Dehn & Co.
Imperial House
15-19 Kingsway
London WC2B 6UZ (GB)

(54) **Linear door motor system for elevators.**

(57) A linear motor is used to actuate an elevator door in response to a control signal for counteracting rotational torque caused by a variable-length moment arm (X_1) about the center of gravity of the door by varying the magnitude of a linear force (F_{lin}) exerted on the door acting through a fixed-length moment arm (H_{cg}) about the center of gravity of the door for providing an opposing rotational torque, thereby counteracting the rotational torque caused by the normal force (F_n). The first and second rotational torques may be controlled to decrease and increase linearly as the door goes through its motion. In this way, the velocity profile varies in a curve similar to one side of the major axis of an ellipse. The normal force may be provided so as to levitate the door to reduce gravitational forces acting on door rollers. The control may be carried out in an open- or closed-looped fashion.

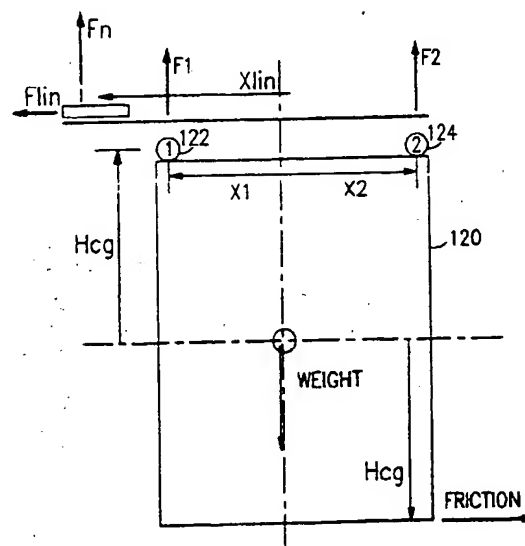


FIG.7

EP 0 614 844 A3

BEST AVAILABLE COPY



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 1697

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	PATENT ABSTRACTS OF JAPAN vol. 16, no. 36 (M-1205) 29 January 1992 & JP-A-03 244 777 (OKAMURA CORP) 31 October 1991 * abstract *	1,5,6,8, 12,13	B66B13/14
A	--- US-A-5 131 506 (MIZUNO ET AL.) * abstract * * figures *	1,8	
A	--- PATENT ABSTRACTS OF JAPAN vol. 16, no. 153 (M-1235) 15 April 1992 & JP-A-04 007 483 (OKAMURA CORP.) 10 January 1992 * abstract *	1,8	
D,A	--- US-A-3 462 883 (REEKS ET AL.) * abstract * * column 2, line 1 - line 16 * * claim 1 *	1,8	
X	--- PATENT ABSTRACTS OF JAPAN vol. 16, no. 82 (M-1215) 27 February 1992 & JP-A-03 264 486 (MITSUBISHI ELECTRIC CORP) 25 November 1991 * abstract *	17	TECHNICAL FIELDS SEARCHED (Int.Cl.5) B66B H02K
Y		18,19 20	
A	--- PATENT ABSTRACTS OF JAPAN vol. 10, no. 141 (E-406) 24 May 1986 & JP-A-61 004 455 (CANON KK) 10 January 1986 * abstract *	18,19	
A	--- -/-	17	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 November 1994	Examiner Salvador, D
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1501 (03.92) (P04C01)

BEST AVAILABLE COPY



European Patent
Office

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet -B-

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

BEST AVAILABLE COPY



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 1697

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	PATENT ABSTRACTS OF JAPAN vol. 14, no. 13 (M-918) 11 January 1990 & JP-A-01 259 705 (TOSHIBA CORP) 17 October 1989 * abstract *	18	
A	-----	17	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 29 November 1994	Examiner Salvador, D
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1501 03.92 (P4/C01)

BEST AVAILABLE COPY



European Patent
Office

EP 94 30 1697 -B-

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims 1-7 : Method of controlling the linear motor for elevator doors.

Claims 8-16, : Apparatus according to claims 1-7.
21
2. Claims 17-20 : Linear motor (parts).

BEST AVAILABLE COPY